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SYLLABUS

J. Davis

1800

gift

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1800

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BRITISH MUSEUM 15 JUL 68

ADDRESS.

AS the plan of theſe Lectures takes for its object the ſeveral branches of Natural and Experimental Philoſophy; the Laws of Motion, Attraction and Gravity, Mechanics, Chemiſtry, Pneumatics, Hydroſtatics, Electricity, Optics, Aſtronomy, Anatomy, &c. (with the various cauſes and effects by which the unerring laws of nature are regulated) will be minutely inveſtigated, by urging the compaſs of natural exiſtence into action, under ſuch circumſtances as cannot fail to gratify the inquiſitive mind, by conveying information through the moſt pleaſing channel.

In the courſe of theſe Lectures ſeveral hundred experiments, many of which have not yet been offered in public, will be exhibited and familiarly explained upon

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whereby uſeful, as well as ſcientific knowledge will be reſcued from perplexity, and, by theſe means, rendered intelligible to the ſlendereſt capacity. The reſult of long experience and intenſe obſervation will be faithfully communicated, and the various obſtacles which ſo frequently occur in the beaten path of ſcience be completely removed, ſo that the gates to the vaſt field of information will be candidly laid open.

Every lecture will be interſperſed with occaſional obſervations upon the beſt means of applying the reſult of experiment to the promotion and preſervation of health.

The Nobility, Clergy, Ladies and Gentlemen, who have honored Mr. HARDIE *with their attendance at his Lectures (prior to his being called into the military ſervice of his country in the line of his profeſſion) are reſpectfully informed that a weekly meeting for Philoſophical Inveſtigation, is about to be re-eſtabliſhed upon the former plan, at his houſe, No.* 51, *Great Portland Street.*

SYLLABUS

OF A

COURSE OF LECTURES.

LECTURE I.

Geology, &c.

AN enquiry into the ſhape, texture, and antiquity of the Earth-----its conſtituent parts examined by actual obſervation on different ſtrata to a great depth. The inherent properties of matter. *Gravity, vis inertia, attraction, and repulſion* conſidered. Several abſurd concluſions and vulgar errors refuted by deciſive and incontrovertible experiments. Why water riſes above its level in capillary tubes. The growth of vegetables---botanical terms explained. All matter proved equally heavy *in vacuo*. Whether the particles of matter touch one another under any circumſtances. *Poroſity, heat*, or the abſorption of caloric. The cauſe of dilatation and fluidity. Different conductors of heat examined, proving in what ratio different metals increaſe their bulk. How heat may be long retained, and applied to general domeſtic purpoſes at much leſs than the uſual expence. Heat and fire produced by the mixture of cold fluids. Ice, and extreme coldneſs, produced in ſummer, or near a fire. The thermometer, elopile, baroſcope, hygrometer, pyrometer, &c. &c. produced, and their principles explained. Elective attraction and affinity. The magnet, when, where, and by whom diſcovered---when applied to navigation---its curious properties and theory demonſtrated by a ſeries of intereſting experiments, tending to prove the exiſtence of an effluvium in a ſtate of circulation---the beſt method of communicating magnetic virtue to iron and ſteel---

to recover its loſt virtue---ſeveral methods of impregnating needles without having recourſe to magnets. The dipping needle explained. The cauſe of the variation of the compaſs exemplified by an artificial earth, with circulating magnetic poles. The magnetic poles not diametrically oppoſite. The line of no variation circulating under the meridian of the aurora borealis. Several curious magnetic deceptions explained. Specimens of the aſbeſtos cloth that cannot be conſumed by fire. Heavy metal that will melt in warm water, with ſeveral other natural and artificial curioſities, &c. &c.

LECTURE II.

Attraction and Gravity.

WHETHER the earth attracts moſt at (or near) its centre. The ſame body proved to have different gravities *above*, *upon*, and *under* the ſurface of the earth. In what ratio gravity decreaſes upwards. The moon proved to move in a ſpiral line, and approaching nearer the earth. Deciſive experiments to prove that a planet or ſatellite takes up as much time in circulating round, as it would in falling into, the central body, without the projectile force. Centre of gravity exiſting in all bodies--always endeavours to be under the centre of ſuſpenſion, proved by the cone and wheel, which ſeem to run up hill, and other deciſive experiments on different bodies. *The line of direction* what, and how curiouſly preſerved under the different attitudes of dancing, ſencing, bowling, &c. exemplified by a curious lay figure with moveable joints, the rope-dancer, ballancer, &c. Why a gooſe ſtoops at paſſing under a gateway. The kangaroo, &c. &c. How much a tower, &c. may incline without falling, illuſtrated by the deſcription of the inclining towers at Caerphily caſtle in Wales, Piſa in Italy, and at Bridgenorth in Shropſhire. Various means of preventing and remedying diſtortions in children and adults, ſhewing the miſchievous tendency of dumb bells, and other exerciſes, under different circumſtances, &c. &c.

BRITISH MUSEUM 15 JUL 68

LECTURE III.

Mechanics.

THE laws of *accelerated motion* in falling bodies demonſtrated. *Compound* and *planetary* motion examined by a variety of new and intereſting experiments. *Momentum* what. Centrifugal and centripetal force explained by machines peculiarly adapted. The figure of the earth proved to be an oblate ſpheroid. The MECHANICAL POWERS, *viz.* the *lever*, *wheel and axle*, *ſyſtem of pullies*, *inclined plane*, *wedge*, and *ſcrew*, explained and differently combined in machines, to produce the beſt operative effects. Method of computing power, velocity, &c. The laws of oſcilatory motions conſidered. The oſcilatory paradox, in which a long pendulum vibrates quicker than a ſhort one, although the diameters of the rods and balls are equal. The Hardiean pendulum, which will oſcelate equally with any given pendulum, from one inch to one hundred yards in length, uſefully applied to muſic, &c. The laws of projectiles---the beſt angle of elevation for the the horizontal range of cannons, mortars, &c. Of *Friction*---the beſt means of reducing it. Several uſeful inventions explained, among which are, the Lecturer's Patent Mangle, his Chiropœdial Car, for travelling without horſes, lately ſent, among other valuable preſents, in the embaſſy to China, as a preſent to the Emperor, from the court of Great Britain *; his method of turning a carriage at right angles with a ſtraight perch. Obſervations and experiments upon wheel carriages. Ferguſon's mechanical paradox, a clock without wheels, weights, or pendulum, with many other uſeful inventions and improvements.

LECTURE IV.

Electricity.

UNIVERSALLY diſſeminated. The different hypotheſes of *negative* and *poſitive*, *vitreous* and *reſinous*, &c. electricities, inveſtigated, ſhewing how far *each* theory may be defended or condemned. Of electrics and conductors. Electric attraction and repulſion. Whether glaſs is permiable to the electric fluid. Why cats' eyes ſhine in the dark. The glow worm conſidered. The nature and effects of thunder and lightning exemplified by pointed and knobbed conductors. Electricity by metallic tractors. Animal electricity. Beſt methods of producing the greateſt electrical effects. Cracked jars rendered uſeful, &c. &c. To illuſtrate the above, the following among other experiments are occaſionally introduced, viz. inſulated feathers, dancing balls, electric ſpider, animated thread, dancing figures, ſuſpended gold, ringing of bells, diamond jars, enchanted ring, electric ſalute, various orreries put in motion, ſpiral tube, porcupine, aurora borealis, electric fly, fiſh, ſwans, boats, &c. &c.---gold melted by the electric ſhock, the powder-houſe, thunder-houſe, obeliſk, battery, cannons, &c. with remarks and cautions on the application of electricity for the cure of various diſorders.

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* See Monthly Register of Literature for October, 1792.

LECTURE V.

Pneumatics.

AIR proved to be an elaſtic body---its weight aſcertained--why denſer near the earth----in what ratio rarer upwards---eſſential for, and how affected by, reſpiration, proved by various experiments on flame, animals, &c.---fluids and ſolids ſuſpended in it. How vapours riſe. The cauſe of hail, rain, ſnow, dew, &c. Winds, irregular, periodical, local, &c. The idea of ſuction proved abſurd. The air-pump, &c. explained. The ſpring of the air proved by the dilating bladder. Aquatic balloon. Experiments on fiſh, &c. Air-gun, ſteam-cannon, beautiful fountains, ſmoky chimney and its remedy, &c. &c. Air proved to be an heterogeneous body by ſyntheſis and analyſis. Eaſieſt method of producing the different gaſſes, viz. carbonic, hydrogene, (or inflammable air) oxygene, (or vital air) nitrous, &c. &c. with the effects produced by mixing them with other bodies, and with one another, exemplified by many beautiful and intereſting experiments on combuſtion. Iron burning, with reſulgent brilliancy, in oxygene gas, &c. Choak-damps and mephitic air produced---their effects on animals---how counteracted---with ſeveral neceſſary cautions. The theory of ſounds inveſtigated. A diſſection and deſcription of the human ear---how affected by ſound, and methods pointed out to preſerve and recover hearing. The nature of harmonic bodies---under what circumſtances they act upon each other, explained by ſeveral pleaſing experiments (upon the ſcience of muſic) with monochords, and other muſical inſtruments. French horns, why hitherto ſo imperfect. A perfect horn produced, which may be played upon in all poſſible keys, without any addition of crooks, &c. Curious method of producing muſical ſounds. The nature of echos. Sound concentrated in the focus of reflecting mirrors---conveyed to a great diſtance by other means than that of air. The whiſpering gallery conſidered and explained by the angles of incidence and reflection. The velocity of ſound. The curious conſtruction of the larynx, and formation of the human voice. Medical remarks on the prevention and cure of diſorders incident to the lungs.

LECTURE VI.

Hydrostatics.

WATER, whether compreſſible---its preſſure in all directions conſidered, and proved by various accurate experiments---why not increaſed in bulk by the introduction of various ſubſtances ---different methods of aſcertaining its purity. Different hygrometers and their uſe in diſcovering the ſpecific gravity and ſtrength of liquors. The ſpecific gravity of gold, platina, ſilver, &c. how aſcertained. Lead cauſed to ſwim, and cork to ſink, in water. The nature of cranes and ſyphons. A curious *ſtraight ſyphon* produced---its advantage over bent ones pointed out. The nature of fountains, rivers, intermittent ſprings, &c. &c. explained by a variety of curious models, repreſentative of the natural proceſſes. Laws of ſpouting

fluids. Beſt method of applying water to mills, &c. Several working models, pump, engines, centrifugal mill, rope pump, ſteam engine, *ſteam carriage*, &c. with a variety of hydraulic machines, hydroſtatic balance and paradox, Tantalus's cup, magic funnel, &c. &c. A rainbow produced in a ſhower of rain. How the weight of any body, from a ſhip and cargo, to a cork, may be aſcertained. The diving-bell introduced and explained. Advice to ſwimmers. Different methods of detecting ſolutions in fluids. Chalybeat, Bath, Seltzer, &c. waters analyzed. The different proceſſes of making the artificial waters explained, with medical remarks on their uſes. Remarks on bathing---the hot, cold, vapour, and ſhower bath conſidered. Derbyſhire ſpars and petrifactions produced, examined, and accounted for. &c. &c.

LECTURE VII.

Optics.

LIGHT, what---its particles, though inconceivably ſmall, proved to be ſubject to all the laws of tangible bodies. Some favourite experiments examined and refuted. Proved to be an adheſive body---its velocity conſidered---capable of being bent or refracted by paſſing through different tranſparent mediums, proved by a pleaſing variety of experiments on light.------- Deſcription and ſpecimens of the various lenſes uſed for optical purpoſes. The theory of viſion, accompanied by a diſſection and deſcription of the human eye. The artificial eye. The eyes of birds, fiſh, and various animals analyzed. Of apparent magnitude. Diſtance. Diſtinct and indiſtinct viſion. The property of the priſm. The cauſe of colours explained. The whole of the priſmatic colours produced by the mixture of colourleſs fluids. Colours changed and reſtored---the recipes for producing the above phœenomena. Tranſparency and opacity conſidered. Several curious, pleaſant, and aſtoniſhing effects and deceptions in viſion explained, among which are, the magic well, the boundleſs gallery, optical paradox, through which the obſerver may diſcern objects, though a ſtone wall ſhould intervene. Reading through a board, door, &c. A rainbow produced---the phenomenon explained. The opera glaſs, refracting and reflecting telleſcopes, microſcopes, magic lanthorn, delineator, ſolar microſcope, produced and explained. How objects may be magnified without lenſes. Curious ſpecimens of vegetation. Chryſtalizations. Silver tree in a ſtate of viſible growth---method of producing it. Microſcopic objects. Different phoſphoric bodies conſidered. To make phoſphorus. A philoſophical lamp, that burns without oil, ſpirit, wick, &c. &c. or any viſible ſupply whatever.

LECTURE VIII.

Chemistry.

ITS object. Chemical terms explained. Different opinions inveſtigated. How far the various operations in chemiſtry can be accounted for, conſiſtent with the doctrine of phlogiſtion. Recent improvements examined. Obſervations on combuſtion. Caloric what. Oxydes or calces, how produced, and explained upon the different principles of ancient and modern chemiſtry. Some of Lavoiſier's experiments adduced. Water formed by the combuſtion of oxygene and hydrogene gaſſes. Solution, diſtillation, precipitation, ſublimation, ſaturation, evaporation, and other chemical proceſſes performed and explained.------ Affinities. Properties of acids, alkalies, ſalts, metals, ores, earths, &c. analyzed by various experiments in oxydating and reviving metals, &c. Earthquakes, volcanos, meteors, &c. Obſervations on the materia medica, and application of medicine in the cure of different diſorders, with recipes for ſeveral proceſſes of making different articles in uſe for arts, manufactures, and private purpoſes. Several coſmetics, rouges, and other applications uſed by the fair ſex, examined. Some pernicious effects pointed out, with the beſt means of aſſiſting and preſerving beauty to the utmoſt poſſible period, &c. &c.

LECTURE IX.

Mathematics, &c.

AN eaſy introduction to geometry, trigonometry, &c. calculated to remove the difficulties which retard the progreſs of that eſſential branch of education, and, by familiar explanations, render the purſuit intereſtingly pleaſant, not only by refreſhing the memory of thoſe who have made ſome progreſs, but alſo to thoſe who have never devoted any attention to that neceſſary ſtudy; in which are laid down ſuch eaſy rules, that an ordinary capacity will be enabled to comprehend the general definitions, and work the moſt uſeful problems in the mathematics. The nature of the line of chords, ſines, tangents, ſecants, &c. familiarized by actual application in meaſuring heights, diſtances, &c. Mr. HARDIE's moveable diagrams being particularly adapted for that purpoſe.

Mr. H. begs leave here to obſerve that, by a peculiar method, he will engage to convey, to a tolerable capacity, a competent idea of geometry, geography, the uſe of the globes, and aſtronomy, in ſix lectures, for a guinea, although the pupil may never before have thought upon the ſubject.

LECTURE X.

Anatomy.

COMPARATIVE anatomy, in which the ſtructure and uſes of the bones, cartillages, ligaments, muſcles, tendons, membranes, nerves, arteries, veins, ducts, with the brain, lungs, heart, ſtomach, liver, pancreas, ſpleen, kidnies, glands, circulation of the blood, digeſtion, &c. &c. of the human body, are explained, and compared with thoſe of quadrupeds and other animals. The formation of different orders of being glanced at, and proved to be admirably adapted to their purſuits in life. The nature of fowls, fiſhes, birds, and reptiles conſidered. Hair, nails, feathers, ſcales, horns, &c. their curious texture and uſes. Of the difference of complexion.

Man proved to have always walked erect. The link (of the chain) of the connexion between the human and brute ſpecies made evident by oſteological productions. Voluntary and involuntary motion conſidered. Of leaping, running, walking, flying, ſwimming, crawling, creeping, &c. The great advantage derived to mechanics from the ſtudy of anatomy and muſcular motion.

LECTURES XI. and XII.

Aſtronomy.

HISTORY and progreſs of aſtronomy. General view of the ſolar ſyſtem. Of the Sun, Mercury, Venus, the Earth and Moon, Mars, Jupiter, Saturn, Georgium Sidus. Refutation of abſurdities. The diameters, diſtances, periodic revolutions, *&c.* how calculated. Of the change of ſeaſon. Of day and night. Diurnal, menſtrual, and annual motions of the earth. The uſe of the globes familiarized, and technical terms explained. The inclination of the axis of the earth to that of the ecliptic, proved to have been and to continue conſtantly leſſening. The probable conſequences which may reſult from a coincidence, and when it will happen. The general phœnomena of the planets---their orbits proved eliptical. The earth proved nearer the ſun in our winter than in ſummer. The conjunctions, elongations, retrogade, and direct motions, and other appearances of the planets, explained upon a grand orrery, with accurate movements. Of the ſatellites---the moon ---her apparent irregularities accounted for---her phaſes, and teleſcopic appearances---her nodes, *&c.* The phœnomenon of the tides explained by experiments upon a curiouſly adapted apparatus. *Eclipſes* of the Sun, Moon, and Jupiter's ſatellites, how cauſed and calculated. How eclipſes of the ſun and moon may happen when both thoſe luminaries are above the horizon. Of comets. Of parallax, refraxion, *&c.* Irregularities produced (by gravity) in the motion of planets. The periods of Saturn proved to be ſhorter, and that of Jupiter longer, than formerly, and accounted for. Fixed ſtars divided into conſtellations. Of new ſtars, changeable, and reapparent ſtars. An attempt to account for ſeveral ſtars altering their relative poſition, magnitude, &c. &c. Of Time, ſolar, true, mean, and apparent---months, weeks, days, &c. A defence of the Moſaic account of the creation. Old and new ſtile. Golden number, dominical letter, epact, &c. what, and how calculated.

N. B. A Planetarium is kept conſtantly regulated to the meridian of each day, ſo that the obſerver may be gratified at one view, with the exact ſituation of all the planets; and, without having recourſe to any calculation, may have a competent idea of their correſponding ſituations in the heavens.

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